## Claims

## What is claimed is:

- 1. A method of fabricating a dense pixel array comprising the steps of:
- (a) printing a photoresist mask and applying said mask to a semiconductor material substrate to form a masked area and an unmasked area on said substrate;
- (b) applying a photoresist material layer to the unmasked area of the substrate, then applying a metal layer over the photoresist material layer and the substrate, and then applying a solvent to remove the photoresist material layer and said metal layer applied over said photoresist material layer to leave a plurality of metal layers superimposed over the unmasked area of the substrate;
- (c) removing the substrate to a depressed substrate surface between the metal layers formed in step (b) to form a plurality of pixels each having an upper metal layer;
- (d) superimposing an insulative layer over each of the metal layers formed in step (c);
- (e) forming a hole in at least one of the insulative layers formed in step (d) so as to expose the metal layer under said insulative layer; and
- (f) superimposing a metallic feature over the insulative layers on a plurality of the pixels and electrically connecting said metallic feature to one of the metal layers superimposed over one of said pixels over which the metallic feature is superimposed.
- 2. The method of claim 1 wherein in step (a) pixel size is defined and is from 1.5 microns to 9.75 microns.
  - 3. The method of claim 2 wherein in step (a) pixel separation is from 0.115

micron to 0.75 micron.

- 4. The method of claim 1 wherein in step (b) the metal is a Au/Ni/Au pixel metal.
- 5. The method of claim 4 wherein the metal is applied by an electron beam lithography process.
- 6. The method of claim 1 wherein in step (c) the pixels are formed by a reactive ion etch (RIE) process.
  - 7. The method of claim 1 wherein in step (d) the insulative layer is a nitride layer.
- 8. The method of claim 7 wherein the nitride layer is comprised of a base nitride layer extending from the base surface of the substrate to the top of the pixel and a top nitride layer superimposed over the base layer and the metal layers on the pixel.
- 9. The method of claim 1 wherein in step (e) the hole is formed by a nitride etch process.
- 10. The method of claim 1 wherein in step (f) the metallic feature is an indium bump.
- 11. The method of claim 1 wherein in step (f) an adhesion metal composition connects the metallic feature and the metal layer supra imposed over one of the pixels.
  - 12. A method of fabricating a dense pixel array comprising the steps of:
- (a) defining the pixel size by printing a photoresist mask and applying said mask to a semiconductor material substrate to form a masked area and an unmasked area on said substrate;
- (b) applying a photoresist material layer to the unmasked area of the substrate, then applying a metal layer over the photoresist material layer and the substrate, and then

applying a solvent to remove the photoresist material layer and said metal layer applied over said photoresist material layer to leave a plurality of metal layers superimposed over the unmasked area of the substrate;

- (c) removing the substrate to a depressed substrate surface between the metal layers formed in step (b) to form a plurality of pixels each having an upper metal layer;
- (d) superimposing a nitride insulative layer over each of the metal layers formed in step (c);
- (e) forming a hole in at least one of the nitride insulative layers formed in step (d) so as to expose the metal layer under said nitride insulative layer;
- (f) superimposing an indium bump over the insulative layers on a plurality of the pixels and electrically connecting said indium bump to said one the metal layers superimposed over one of said pixels over which the said indium bump is superimposed.
- 13. A product of a method of fabricating a dense pixel array comprising the steps of:
- (a) printing a photoresist mask and applying said mask to a semiconductor material substrate to form a masked area and an unmasked area on said substrate;
- (b) applying a photoresist material layer to the unmasked area of the substrate, then applying a metal layer over the photoresist material layer and the substrate and, then applying a solvent to remove the photoresist material layer and said metal layer applied over said photoresist material layer to leave a plurality of metal layers superimposed over the unmasked area of the substrate;
  - (c) removing the substrate to a depressed substrate surface between the metal

layers formed in step (b) to form a plurality of pixels each having an upper metal layer;

- (d) superimposing an insulative layer over each of the metal layers formed in step (c);
- (e) forming a hole in at least one of the insulative layers formed in step (d) so as to expose the metal layer under said insulative layer; and
- (f) superimposing a metallic feature over the insulative layers on a plurality of the pixels and electrically connecting said metallic feature to one of the metal layers superimposed over one of said pixels over which the metallic feature is superimposed.
  - 14. An opto-electronic device comprising:
    - a base semiconductor substrate;
- a plurality of semiconductor pixels each having an upper metallic layer and extending upwardly from the base semiconductor substrate;
- an insulative layer superimposed over the upper metallic layers on the pixels;
- a via hole extending through the insulative layer to expose one of upper metallic layers superimposed over one of the pixels;
  - a metallic feature superimposed over at least one of the pixels;
- a conductive material connecting said metallic features and said upper metallic layer exposed by said via hole.
- 15. The device of claim 14 wherein said pixels have a pixel size and said pixel size is from 1.5 microns to 9.75 microns.
  - 16. The device of claim 15 wherein there is a pixel separation and said

separation is from 0.115 micron to 0.75 micron.

- 17. The device of claim 14 wherein the metallic layer is comprised of a Au/Ni/Au pixel metal.
  - 18. The device of claim 14 wherein the insulative layer is a nitride layer.
- 19. The device of claim 18 wherein the nitride layer is comprised of a base nitride layer extending from the base surface of the substrate to the top of the pixel and a top nitride layer superimposed over the base layer and the metal layers on the pixel.
  - 20. The device of claim 14 wherein the metallic feature is an indium bump.
  - 21. An opto-electronic device comprising:
    - a base semi-conductor substrate;
- a plurality of semiconductor pixels each having an upper metallic layer and extending upwardly from the base semiconductor substrate;
  - a nitride layer superimposed over the upper metallic layers on the pixels;
- a via hole extending through the insulative layer to expose one of the upper metallic layers superimposed over one of the pixels;
  - an indium bump superimposed over at least one of the pixels;
- a conductive material positioned in said via hole to electrically connect the indium bump and said upper metallic layer exposed by said via hole.